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PATENT APPLICATION  
IN THE U.S. PATENT AND TRADEMARK OFFICE  
November 28, 2006

Applicant(s): Yoichi SANO  
For: METHOD FOR PRODUCING ELECTROLYZED WATER

Serial No.: 10/629 165                      Group: 1742  
Confirmation No.: 5995  
Filed: July 29, 2003                      Examiner: Smith  
International Application No.: N/A  
International Filing Date: N/A  
Atty. Docket No.: Hiroshi Tanaka C-3

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**LETTER TRANSMITTING APPEAL BRIEF FEE**

Sir:

Enclosed is Appellant's check in the sum of \$250.00, representing payment of the Appeal Brief fee. The Commissioner is hereby authorized to charge any additional fee which may be required by this paper, or to credit any overpayment to Deposit Account No. 06-1382. A duplicate copy of this sheet is enclosed.

Respectfully submitted,

IN DUPLICATE

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**APPELLANT'S BRIEF ON APPEAL**

Sir:

This is an appeal from the decision of the Examiner dated March 30, 2006, finally rejecting Claims 3-15.

REAL PARTY IN INTEREST

First Ocean Co., Ltd. Is the assignee of the present application and the real party in interest.

RELATED APPEALS AND INTERFERENCES

There are no related appeals and interferences regarding the present application.

STATUS OF CLAIMS

Claims 1 and 2 have been canceled. Claims 3-15 are pending and are the claims being appealed.

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STATUS OF AMENDMENTS

The Request for Reconsideration dated July 28, 2006 was considered by the Examiner.

SUMMARY OF CLAIMED SUBJECT MATTER

Appellant's invention, as defined by independent Claim 12, is directed to a method of producing acidic and alkaline electrolyzed water which comprises the steps of providing an electrolyzer having an anode chamber containing an anode and a cathode chamber containing a cathode separated by a diaphragm, feeding softened water to the cathode chamber and unsoftened water containing an electrolyte to the anode chamber and performing electrolysis in the electrolyzer to produce acidic and alkaline electrolyzed water, wherein the flow rate of the softened water to the cathode chamber is no greater than 40mL/min. per ampere of loading current (page 3 of the clean copy of the specification, lines 9-21 and page 5 of the clean copy of the specification, lines 17-24).

Appellant's invention, as defined by independent Claim 13, is directed to a method of producing acidic and alkaline electrolyzed water, comprising the steps of providing an electrolyzer having an anode chamber containing an anode, a cathode chamber containing a cathode and an intermediate chamber separated from the anode chamber by a first diaphragm and the cathode chamber by a second diaphragm, providing unsoftened water containing an electrolyte in the intermediate chamber and feeding softened water to the cathode chamber and unsoftened water to the anode chamber and performing electrolysis in the electrolyzer to produce acidic and alkaline electrolyzed water, wherein the flow rate of the softened water to the cathode chamber is no greater than 40mL/min. per ampere of loading current (page 3 of the clean copy of the specification, lines 22-35 and page 4 of the clean copy of the specification, lines 1-6 and Example 1 on pages 11-13 of the clean copy of the specification).

Claim 3 limits Claim 12 in requiring that softening treatment be carried out by passing the water for the cathode chamber through a water softening apparatus in which a cationic exchange resin is filled (page 4 of the clean copy of the specification, lines 6-9).

Claim 4 limits Claim 12 in requiring that flow rate of water to be provided to the anode chamber is restricted to 40mL/min. per ampere of loading electric current or less (page 4 of the clean copy of the specification, lines 10-14).

Claim 5 limits Claim 12 in requiring that water for dilution be mixed with electrolyzed water produced in the anode chamber to prepare acidic electrolyzed water having a pH from 2.0 to 4.0 and water for dilution is mixed with electrolyzed water produced in the cathode chamber to prepare alkaline electrolyzed water having a pH from 10 to 13 (page 4 of the clean copy of the specification, lines 14-20).

Claim 6 limits Claim 13 in requiring that the water softening treatment be carried out by passing the water through a water softening apparatus in which a cationic exchange resin is filled (page 4 of the clean copy of the specification, lines 6-9).

Claim 7 limits Claim 13 in requiring that the flow rate of water to be provided to the anode chamber be restricted to 40mL/min. per ampere of loading electric current or less (page 4 of the clean copy of the specification, lines 10-14).

Claim 8 limits Claim 3 in requiring that the flow rate of water to be provided to the anode chamber is restricted to 40mL/min. per ampere of loading electric current or less (page 4 of the clean copy of the specification, lines 10-14).

Claim 9 limits Claim 13 in requiring that the water for dilution be mixed with electrolyzed water produced in the anode chamber to prepare acidic electrolyzed water having a pH from 2.0 to 4.0 and water for dilution is mixed with electrolyzed water produced in the cathode chamber to prepare alkaline electrolyzed water having a pH from 10 to 13 (page 4 of the clean copy of the specification, lines 14-20).

Claim 10 limits Claim 3 in requiring that the water for dilution be mixed with electrolyzed water produced in the anode chamber to prepare acidic electrolyzed water having a pH from 2.0 to 4.0 and water for dilution is mixed with electrolyzed water produced in the cathode chamber so as to prepare alkaline electrolyzed water having a pH from 10 to 13 (page 4 of the clean copy of the specification, lines 14-20).

Claim 11 limits Claim 4 in requiring that the water for dilution be mixed with electrolyzed water produced in the anode chamber to prepare acidic electrolyzed water having a pH from 2.0 to 4.0 and water for dilution is mixed with electrolyzed water produced in the cathode chamber to prepare alkaline electrolyzed water having a pH from 10 to 13 (page 4 of the clean copy of the specification, lines 14-20).

Claim 14 limits Claim 13 in requiring that water softening treatment be carried out by passing the water for the cathode chamber through a water softening apparatus in which a cationic exchange resin is filled (page 4 of the clean copy of the specification, lines 6-10).

Claim 15 limits Claim 12 in requiring that an electrolyte be added to the water fed into the cathode chamber (page 5 of the clean copy of the specification, lines 30-34).

GROUND OF REJECTION TO BE REVIEWED ON APPEAL

Appellant respectfully requests a review of the rejection of Claims 3, 4, 6-8 and 12-14 under 35 USC 103(a) as being unpatentable over Shirota et al. in view of Yamaguti et al. Appellant also respectfully requests review of the rejection of Claims 5 and 9-11 under 35 USC 103(a) as being unpatentable over Shirota et al. in view of Yamaguti et al. and further in view of Su et al. Appellant additionally requests review of the rejection of Claim 15 under 35 USC 103(a) as being unpatentable over Shirota et al. in view of Yamaguti et al. and further in view of Sawamoto et al.

ARGUMENT

Rejection of Claims 3, 4, 6-8 and 12-14  
Under 35 USC 103(a) as Being Unpatentable Over  
Shirota et al. in View of Yamaguti et al.

In general, the presently claimed invention is based on the discovery that the sticking of scale to a cathode plate in an electrolyzer and generation of sludge in alkaline water after electrolyzed alkaline water and untreated water are mixed and stored in tanks can be effectively avoided by strictly restricting the water flow rate to the cathode compartment with respect to the electric current to the cathode plate and softening only the water fed to the cathode compartment to produce acidic electrolyzed water in the anode chamber and alkaline electrolyzed water in the cathode chamber. That is, there are two critical features of the present invention. (1) Controlling the flow rate of water to be supplied to the cathode chamber to an amount of 40 mL (milliliter)/min. per ampere of loading electric current and (2) feeding softened water only to the cathode chamber.

Claims 13, 6, 7 and 14 require that the acidic and alkaline electrolyzed water be produced in an electrolyzer having an anode chamber containing an anode, a cathode chamber containing a cathode and an intermediate chamber separated from the anode chamber by a first diaphragm and a cathode chamber by a second diaphragm. Unsoftened water containing an electrolyte is fed to the intermediate chamber, softened water is fed to the cathode chamber and unsoftened water is fed to the anode chamber. Electrolysis is performed in the electrolyzer to produce acidic and alkaline electrolyzed water and the flow rate of the softened water to the cathode chamber is no greater than 40 mL/min. per ampere of loading current.

The primary Shirota et al. reference has been cited by the Examiner as teaching a method for producing acidic and alkaline electrolyzed water using both a two-chamber electrolysis cell and a three-chamber electrolysis cell. The

Examiner states that this reference further discloses an electrolyte being added to the water to be electrolyzed and since the water used in the anode chamber is tap water, only the water provided to the cathode is previously softened. The Examiner further states that since this reference discloses using pure water as make-up water to feed a reservoir 4 and that since this reservoir would not contain any dissolved salts of magnesium, calcium or iron, Shirota et al. discloses the feeding of solvent water to the cathode chamber. First of all, Appellant wishes to point out that Shirota et al. in column 7, lines 42-44 state that the make-up water may be tap water. Additionally, the container bath 4 contains alkaline ionized water removed from the cathode compartment and not softened water. Further, as pointed out in the Request for Reconsideration, softened water and pure water are different from each other.

Softened water is water in which the calcium, magnesium and other divalent and higher cations found in ordinary water are exchanged for sodium ions, using a cation exchange resin. This process actually slightly increases the number of cations and anions in the solution but eliminates the polyvalent materials that cause scale on the electrodes. This is different from "pure" water in which anions and cations have been removed. Producing softened water with an anion exchange resin loaded with sodium is much less expensive than actually removing both anions and cations to produce deionized "pure" water. Therefore, Appellant respectfully submits that the Shirota et al. reference does not disclose either of the two critical features of the present invention. That is, this reference has no disclosure with respect to the feeding of softened water to the cathode chamber and the feeding of this softened water to the cathode chamber at a flow rate not greater than 40 mL/min. per ampere of loading current. Therefore, the secondary Yamaguti et al. reference must provide the motivation to one of ordinary skill in the art to modify the primary Shirota et al. reference in a manner that

will yield the presently claimed invention. It is respectfully submitted that the secondary Shirota et al. reference contains no such disclosure.

Yamaguti et al. discloses a method and device for producing electrolytic water in which the electrolytic water is produced by controlling the electrolytic degree of electrolytic water discharged from an electrolyzer in accordance with the pH value, electric conductivity, oxidation-reduction potential and ion concentration. This reference discloses that the ratio between the flow rate of water into the cell and the applied current can be varied to obtain electrolytic water having a desired pH value. This reference actually advocates the regulation of the relative turn-over rate of the cathode and anode compartments, in combination with the addition of salt to both sides of the membrane (column 2, lines 15-24) to produce highly alkaline and acidic water at appropriate levels. That is, at column 2, lines 60-ff, this reference states:

"By controlling the electrolysis on the basis of the electric conductivity and/or oxidation-reduction potential detected from the raw water and/or electrolytic water by use of the sensor means, the pH value and/or discharge flow quantity of the acidic and/or alkaline water can be effectively controlled.

The strength of electrolysis can be freely controlled by regulating the discharge flow ratio of the acidic water to the alkaline water and/or the quantity of electrolytic load electricity applied to the electrolyzer in accordance with the electrolyzing condition or the electrolytic degree of the electrolytic water discharged from the electrolyzer. The discharge flow ratio of the acidic water to the alkaline water can be varied by moving the barrier membrane by which the anode and cathode chambers are partitioned to vary the capacities of the anode and cathode chambers. Also, the discharge flow ratio of the acidic water to the alkaline water can be varied by controlling the flow control means provided on at least one of the discharge passages from the anode and cathode chambers."



The control equation at column 8, line 39, is expressed in flow rate and not amps. Wherever current is expressed in this reference, it is given as a set value of 30 amps at 16 volts such as at column 7, lines 24-50. The closest disclosure this reference has to the present invention is at column 12, lines 20-31, where the obvious is stated: that the amount of electricity per flow rate of the raw water can be increased by decreasing the flow quantity of the raw water. However, there is no suggestion in this reference that anything advantageous would be obtained by feeding softened water into a cathode compartment at a flow rate of no more than 40 mL/min. per ampere of current loading. Therefore, this reference adds nothing to the primary Shirota et al. reference.

As pointed out above, Shirota et al. in combination with Yamaguti et al. does not even present a showing of prima facie obviousness under 35 USC 103(a) for Claims 13, 6, 7 and 14. Moreover, even if these references did present a showing of prima facie obviousness under 35 USC 103(a), sufficient objective evidence is of record in the present application to rebut any proper showing of prima facie obviousness under 35 USC 103(a).

On pages 11-15 of the "clean" copy of the present specification, an example according to the present invention and two comparative examples are presented. In Example 1, a three chamber electrolyzer is used in which softened water is only provided to the cathode chamber and the softened water is supplied at a rate of 100 mL/min. and at a direct electric current of 6.5 amperes so that a flow rate of approximately 15.4 mL/min. per ampere of loading current is used to feed the softened water into the cathode compartment. Maintaining the same operating conditions, the electrolysis was continuously conducted for 48 hours and sticking of scale to the cathode was not observed at all. Additionally, the generation of a precipitate in the obtained alkaline electrolyzed water was also not observed.

In Comparative Example 1, the flow rate of the water to be introduced to the cathode compartment was increased to 1000 mL/min. and the flow rate of water not to be electrolyzed was adjusted to be 0 mL/min. All other conditions were the same as in Example 1 and electrolyzed water was produced. After starting the electrolysis process, the voltage started to elevate along with a lapse in time and, after 48 hours, it was impossible to continue the electrolysis due to high voltage. This is due to the hardness component remaining in the water to be introduced into the cathode chamber and the remaining hardness component adhering to the cathode plate as scale.

In Comparative Example 2, unsoftened water was fed to the cathode compartment with all other parameters being the same as in Example 1 and electrolyzed water was produced. A 5000 mL specimen of the alkaline electrolyzed water produced in Example 1 and comparative Example 2 was filtered and weighed after drying so that the residue could be measured. The results are shown in the table below.

Table 1

	weight of filter paper before filtration ( g )	weight of filter paper after filtration ( g )	weight change before and after filtration ( g )	required time to filter 5000mL
Example 1	1.6529	1.7183	0.0654	50 minutes
Co. Example 2	1.6238	2.0154	0.3923	6 hours

As shown in Table 1 above, the amount of precipitate in the alkaline electrolyzed water produced in Comparative Example 2 was greater than the amount of precipitate in the alkaline electrolyzed water produced in Example 1. The filtering time for the alkaline electrolyzed water produced in Comparative Example 2 was longer than that of Example 1 because the filter paper of Comparative Example 2 was plugged with the precipitate. After the filtration, a yellowish adherent was observed on the filter paper. Moreover, the amount of scale contained in the alkaline electrolyzed water

of the examples was calculated. The amount of scale contained in the alkaline electrolyzed water produced in Example 1 was 13 ppm and that of Comparative Example 2 was 78 ppm.

Therefore, although neither the Shirota et al. or Yamaguti et al. references disclose either the feeding of softened water only to the cathode compartment or the feeding of the softened water to the cathode compartment at the claimed low rate based on the current loading, even if these references did individually contain one of the features of the present invention, the test data contained in the present specification establishes the criticality of the two claimed features of the present invention when used in a three compartment electrolysis cell. Therefore, Claims 13, 6, 7, 9 and 14 are clearly patentably distinguishable over the combination of Shirota et al. and Yamaguti et al.

With respect to the rejection of Claims 12, 3-5, 8, 10, 11 and 15 under 35 USC 103(a) as being unpatentable over Shirota et al. in view of Yamaguti et al., Appellant once again points out, as discussed above, that these claims require two critical parameters be followed during the electrolysis. The first parameter is that softened water be fed only to the cathode chamber and the second parameter is that the flow rate of the softened water to the cathode chamber is no greater than 40 mL/min. per ampere of loading current. As discussed above, neither the Shirota et al. reference or the Yamaguti et al. reference show either one of the two critical requirements of the present claims. Therefore, these references do not even present a showing of prima facie obviousness under 35 USC 103(a) for Claims 3, 4, 8 and 12.

Rejection of Claims 5 and 9-11  
Under 35 USC 103(a) as Being Unpatentable Over  
Shirota et al. in View of Yamaguti et al. and  
Further in view of Su et al.

The Su et al. reference has been cited by the Examiner as teaching a method for producing electrolyzed water in which the desired pH range of the anode water is from 2 to 4. This reference has been cited by the Examiner as curing the deficiency in Shirota et al. in view of Yamaguti et al. with respect to diluting the anode water such that the pH is between 2 and 4. However, as explained above for Claims 6, 7, 13 and 14, Claim 9 requires the use of a three compartment electrolyzer in which softened water is fed only to the cathode compartment and at a flow rate of no more than 40 mL/min. per ampere of loading current. None of the references cited by the Examiner disclose either one of these conditions during electrolysis. Therefore, a showing of prima facie obviousness under 35 USC 103(a) is not made for Claim 9. Moreover, given the objective test data contained in the present specification for a three compartment electrolyzer, even if a proper showing of prima facie obviousness under 35 USC 103(a) was made for Claim 9, the objective test data present in the instant specification is more than sufficient to rebut this showing. As such, Claim 9 is found to be clearly patentably distinguishable over Shirota et al. in view of Yamaguti et al. and further in view of Su et al.

Claims 5, 10 and 11 all require the critical conditions of the present invention. That is, that softened water be fed only to the cathode chamber and that the softened water be fed at a flow rate of no more than 40 mL/min. per ampere of loading current. Since Shirota et al., Yamaguti et al. and Su et al. do not disclose either of the critical features of the present invention, it is respectfully submitted that these references do not even present a showing of prima facie obviousness under 35 USC 103(a) with respect to the subject

matter of Claims 5, 10 and 11. Therefore, these claims are found to be clearly patentably distinguishable over these references.

Rejection of Claim 15

Under 35 USC 103(a) as Being Unpatentable Over  
Shirota et al. in View of Yamaguti et al. and  
Further in view of Sawamoto et al.

In the final rejection of Claim 15, the Examiner states that Shirota et al. in view of Yamaguti et al. does not disclose the addition of an electrolyte to the feed of the cathode chamber. Sawamoto et al. has been cited by the Examiner as teaching a method of adding supporting electrolyte to cathode liquid. However, neither Sawamoto et al., Yamaguti et al. or Shirota et al. disclose either of the critical features of Claim 15. That is, Claim 15 also requires that softened water be fed only to the cathode compartment of an electrolyzer and that the feed rate of the softened water to the cathode compartment be no more than 40 mL/min. per ampere of loading current. Therefore, Shirota et al. in view of Yamaguti et al. and further in view of Sawamoto et al. does not even present a showing of prima facie obviousness under 35 USC 103(a) with respect to Claim 15. Therefore, Claim 15 is found to be clearly patentably distinguishable over these references.

CONCLUSION

As discussed above, the present invention is based on the discovery that the formation of scale on a cathode and generation of sludge in alkaline water after electrolyzed alkaline water and untreated water are mixed and stored in tanks can be avoided by conducting the electrolysis of the water under specific conditions. The present claims require that the water flow rate to the cathode compartment of electrolyzer be limited to no more than 40 mL/min. per ampere

of loading current and that softened water is fed only to the cathode compartment. The present invention is based on the discovery that both of these requirements, during the generation of acidic and alkaline electrolyzed water, avoid the formation of scale on the cathode and the generation of sludge after the electrolyzed alkaline water and untreated water are mixed and stored in tanks downstream from the electrolysis process. The references cited by the Examiner do not disclose either one of the critical features of the present invention. Moreover, objective test data is contained in the present specification for a three compartment electrolyzer which is more than sufficient to abut any proper showing of prima facie obviousness under 35 USC 103(a). As such, reversal of the Examiner is respectfully solicited.

Respectfully submitted,

TFC/cmc

  
Terryence F. Chapman

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Encl: Claims Appendix  
Evidence Appendix  
Related Proceedings Appendix  
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CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on November 28, 2006.

  
Terryence F. Chapman

CLAIMS APPENDIX

12. A method of producing acidic and alkaline electrolyzed water, comprising the steps of:

providing an electrolyzer having an anode chamber containing an anode and a cathode chamber containing a cathode separated by a diaphragm;

feeding softened water to the cathode chamber and unsoftened water containing an electrolyte to the anode chamber; and

performing electrolysis in the electrolyzer to produce acidic and alkaline electrolyzed water, wherein the flow rate of the softened water to the cathode chamber is no greater than 40mL/min. per ampere of loading current.

3. The method for producing electrolyzed water of Claim 12, wherein water softening treatment is carried out by passing the water for the cathode chamber through a water softening apparatus in which a cationic exchange resin is filled.

4. The method for producing electrolyzed water according to Claim 12, wherein the flow rate of water to be provided to the anode chamber is restricted to 40mL/min. per ampere of loading electric current or less.

5. The method for producing electrolyzed water according to Claim 12, wherein water for dilution is mixed with electrolyzed water produced in the anode chamber to prepare acidic electrolyzed water having a pH from 2.0 to 4.0 and water for dilution is mixed with electrolyzed water produced in the cathode chamber to prepare alkaline electrolyzed water having a pH from 10 to 13.

8. The method for producing electrolyzed water according to claim 3, wherein the flow rate of water to be

provided to the anode chamber is restricted to 40mL/min. per ampere of loading electric current or less.

10. The method for producing electrolyzed water according to claim 3, wherein water for dilution is mixed with electrolyzed water produced in the anode chamber to prepare acidic electrolyzed water having a pH from 2.0 to 4.0 and water for dilution is mixed with electrolyzed water produced in the cathode chamber so as to prepare alkaline electrolyzed water having a pH from 10 to 13.

11. The method for producing electrolyzed water according to claim 4, wherein water for dilution is mixed with electrolyzed water produced in the anode chamber to prepare acidic electrolyzed water having a pH from 2.0 to 4.0 and water for dilution is mixed with electrolyzed water produced in the cathode chamber to prepare alkaline electrolyzed water having a pH from 10 to 13.

15. The method for producing electrolyzed water according to Claim 12, wherein an electrolyte is added to the water fed into the cathode chamber.

13. A method of producing acidic and alkaline electrolyzed water, comprising the steps of:

providing an electrolyzer having an anode chamber containing an anode, a cathode chamber containing a cathode and an intermediate chamber separated from the anode chamber by a first diaphragm and the cathode chamber by a second diaphragm;

providing unsoftened water containing an electrolyte in the intermediate chamber and feeding softened water to the cathode chamber and unsoftened water to the anode chamber; and

performing electrolysis in the electrolyzer to produce acidic and alkaline electrolyzed water, wherein the



flow rate of the softened water to the cathode chamber is no greater than 40mL/min. per ampere of loading current.

6. The method for producing electrolyzed water of Claim 13, wherein the water softening treatment is carried out by passing the water through the water softening apparatus in which a cationic exchange resin is filled.

7. The method for producing electrolyzed water according to Claim 13, wherein the flow rate of water to be provided to the anode chamber is restricted to 40mL/min. per ampere of loading electric current or less.

9. The method for producing electrolyzed water according to Claim 13, wherein water for dilution is mixed with electrolyzed water produced in the anode chamber to prepare acidic electrolyzed water having a pH from 2.0 to 4.0 and water for dilution is mixed with electrolyzed water produced in the cathode chamber to prepare alkaline electrolyzed water having a pH from 10 to 13.

14. The method for producing electrolyzed water according to Claim 13, wherein water softening treatment is carried out by passing the water for the cathode chamber through a water softening apparatus in which a cationic exchange resin is filled.

EVIDENCE APPENDIX

No other evidence is relied upon by Appellant.

RELATED PROCEEDINGS APPENDIX

There are no related proceedings to the present application.